which finger is touched. Leg: reflexes present; sensation normal; no Babinski or ankle clonus; no limitation of motion; some spasticity at times.

Eyes, nothing abnormal noted except exophthalmos of right eye.

Nose, discharge from right side, purulent tinged with blood; tumor mass noted in right side of nose, quite extensive.

Autopsy: Old blood in right antrum. Upon opening the roof of the orbit on the right side there was found normal orbital fat; but on removing the base found antrum filled with grayish brown and old hemorrhagic mass. In frontal sinus and extending into orbit and occupying base was found a tumor which could be removed only with difficulty and in fragments. Microscopical examination of brain substance around the cerebral hemorrhage show pigmentation marked about site of hemorrhage with atrophy of cellular elements. Basal ganglia pushed over. Ventricle on right side partially collapsed; no tumor. Large clot bigger than egg in right parietal region and posterior to posterior fontanelle; consistency of brain around clot very soft. Basilar vessels normal.

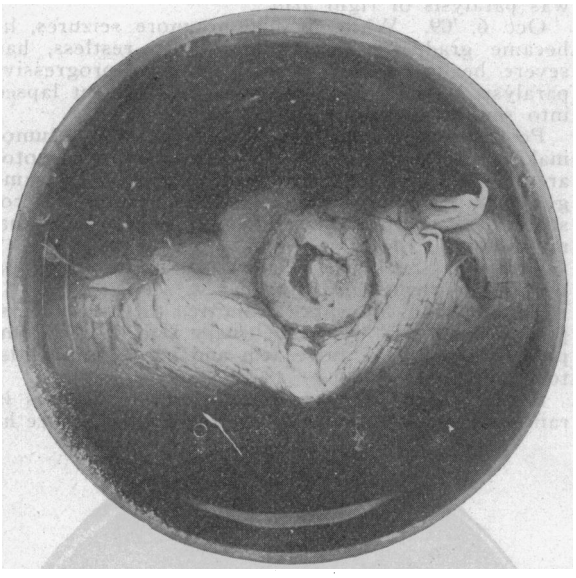

Fig. 7. Case VII—Tumor of the fourth ventricle.

Case VII. The specimen of tumor of the 4th ventricle was loaned me by the Hendrick Laboratory (of Dr. F. C. E. Mattison). W. H. Age 20. In August, 1906, he complained of some pain in his jaws. September 22nd he had paralysis of right side of face. Early in October he commenced to have difficulty with his right eye and general diplopia. Some numbness and tingling in left arm and leg. Dizzy most of the time, nausea almost continuously. A tentative diagnosis of gumma in the floor of the 4th ventricle was made, and he was put upon iodide of potassium together with mercury.

Died March 26, 1907. Autopsy by Dr. Black showed glioma on the floor of the 4th ventricle to the right of median line, size of walnut.

I wish to express my thanks to Dr. Mattison for his permission to use this case.

In conclusion I desire to express my obligation and thanks to Dr. Black for the specimens from the Hendrick Laboratory and to Miss Tucker, Secretary, and Miss Bettin, of the 3rd-year class in the Los Angeles Dept. of Medicine, University of California, for their help in assembling the specimens and histories.

THE INDICATIONS, TECHNIC AND RESULTS IN DECOMPRESSIVE OPERATIONS ON THE BRAIN.*

By WALLACE I. TERRY, M. D., San Francisco.

The idea of trephining the skull for the relief of increased intracranial pressure is an old one—indeed it is possible that the crude openings in the skulls of some prehistoric individuals were made for the purpose of relieving persistent headache due to tumor. The credit of advocating decompressive trephining for tumors of the brain which were not removable or could not be located is due to Horsley, although others had previously reported cases where such operations had been done. It was not, however, until Harvey Cushing, basing has ideas largely upon his experimental work on cerebral compression, emphasized the value of decompression and made great improvements in the technic of the operation, that the procedure became well known and quite generally adopted.

When we consider that the adult brain is enclosed in a rigid bony cavity, it is readily understood that any neoplasm encroaching on this cavity does so at the expense of the blood, the cerebral fluid or the brain tissues normally occupying it. Within certain limits, the blood and cerebro-spinal fluid accommodate themselves to the increased intracranial pressure and the patient may present no symptoms of brain tumor. When, however, the tumor is larger or produces irritative symptoms with an increase of fluid or blood in the cranial cavity, the patient will then manifest the usual symptoms of increased intracranial tension, such as headache, vomiting and eye changes. It has been said that the diagnosis of a brain tumor is comparatively simple, but the localization of it is oftentimes a difficult or impossible matter. It is in just such cases where a tumor cannot be located or where, because of its size or location, it cannot be removed that a decompressive operation is indicated. By giving the brain a chance to expand the symptoms are ameliorated or even cured. Most important of all, the eye changes, beginning with choked disc and ending with optic nerve atrophy, may be stopped. It is a well recognized fact that the atrophied optic nerve does not regenerate and that often when atrophy has begun it progresses, despite the relief of pressure. Choked disc, however, can usually be improved and impending blindness prevented by decompression. Horsley says: "In no case of optic neuritis (not, of course, of toxemic or anemic origin) should the process be allowed to continue after it has once been diagnosed, and if blindness results therefrom the responsibility is very heavy on any one who fails to advise such a simple procedure as opening the dura mater."

Occasionally we see instances of natural decompression; in the young, by the separation of the sutures, and in other cases where a tumor mass has grown through the skull and permitted expansion of the cranial contents. Two instances of the latter form have come under my personal observation—both being sarcomas springing from the dura mater in the upper occipital region. One patient was re-

* Read at the Forty-first Annual Meeting of the State Society, Santa Barbara, April, 1911.

ferred to me by Dr. S. T. Pope with the history that he had noticed a mass on the back of his head about ten years previously. He complained of headache, dizziness and diminished vision which proved to be from a hemianopsia. At operation two years ago it was found that a dural sarcoma had perforated the skull. A considerable area of skull and most of the tumor was removed and the remainder of the tumor treated with the Roentgen ray, injections of Coley's fluid, and acetone, with the result that the headaches and dizziness disappeared and the field of vision became considerably increased. The second case showed headache, vertigo and marked optic atrophy at the time he came into my service at the San Francisco City and County Hospital and a similar operation a month ago has given much relief, but, of course, the blindness persists.

In some cases of cerebral tumor, compression has been relieved by the withdrawal of fluid by spinal puncture, but as this procedure is so dangerous in such cases it should never be done. There are numerous cases on record of sudden death after spinal puncture with withdrawal of considerable fluid, due to crowding of the medulla and the walls of the fourth ventricle into the foramen magnum. For diagnostic purposes the pressure of the spinal fluid can be determined by suitable apparatus without losing more than a few drops of fluid and part of this can be used for chemical and microscopical examination. Krause records a case of brain tumor in which after removing only 2 cc. of spinal fluid the patient immediately vomited, went into collapse and remained unconscious for a number of hours.

It is an unfortunate thing that the diagnosis of brain tumor is so often followed by the prolonged administration of antileutic remedies, with the result that valuable time is lost. It is a far better plan to first relieve the pressure and then to medicate, than the reverse. The Wasserman and other similar tests for lues are almost certain diagnostic measures, and for one to push the iodides and mercury in suspected brain gumma with a negative Wassermann is wrong. Horsley is strongly of the opinion that these gummata are not cured by such treatment and that they should be removed if possible. Whether the new arsenical preparations will accomplish the results remains to be seen.

Cushing has employed subtemporal decompression as a preliminary step in the removal of tumors in some cases. In one instance he bared the anterior half of the left hemisphere and finding the dura very tight, he did a left subtemporal decompression and closed the first bone flap. Five days later, as the pressure was not sufficiently relieved, he did a right subtemporal decompression and again after five days he reflected his original bone flap and successfully removed a prefrontal tumor without subjecting the brain to the dangers incident to a marked degree of protrusion.

Cushing has also applied the principle of decompression to cases of cerebral hemorrhage in the newborn, basal fractures of the skull, epilepsy and headaches of the migraine type. He has achieved some splendid results in cerebral hemorrhages in the newborn—those cases which result in Little's disease. About half of his patients recovered. I have had but one such case, referred to me by Drs. Spaulding and Moffitt, upon which I operated in 1905 with a fatal termination due to shock.

In basal fractures of the skull, Cushing has made decompression with drainage a routine procedure at Johns Hopkins Hospital. In these cases it is difficult to generalize, for the brain injury is often so severe that the patients will die despite any treatment and in others recovery will ensue with practically no treatment. My own experience in basal fractures has been fairly large and while I believe that decompression with drainage is a rational procedure, I have been disappointed with the results I have obtained from it. It is not alone that the decompression aims to relieve the pressure from hemorrhage at the base but it is also for the purpose of minimizing the disastrous effects of edema of the brain and its membranes which rapidly follows trauma. Decompression for epilepsy is indicated only when we have evidence of abnormal tension, the cause of which is obscure or cannot be removed. As regards decompression for headaches, I quote from Cushing: "There are many types, of course, of hemicrania and many causes for it, but in one familiar group there occurs during the attack a marked arterial dilatation of the temporal vessels, accompanied by a venous congestion which is seen best in the external branches of the ophthalmic vein, but which is observable, too, by the ophthalmoscope in the eye grounds. Ptosis, pupillary inequality, vomiting, slow pulse and other familiar symptoms, associated at times with a low grade of choked disc, accompany the attacks, and a number of these individuals have submitted with eager willingness to the experiment of a subtemporal decompression, which has resulted in a considerable measure of relief in most of them." Cushing states, however, "that the matter demands much longer study before it can be advocated on a sound basis of therapy," but it seems like a step in the right direction.

As regards the seat of decompression, Horsley first advocated making it over the suspected area but he now employs the subtemporal route in those cases of tumor which cannot be safely removed or in which localization is impossible. If the pressure is subtentorial, then of course the decompression should be in the occipital region.

The credit for originating the subtemporal and the suboccipital decompressive operations belongs to Cushing and as they possess such manifest advantages over the other types of operation, the technic of them will be briefly considered. The major principle involved in Cushing's operations is the restraint of the cerebral or cerebellar hernia by aponeurotic and muscular tissue. Where the hernia is covered only by the scalp, the growth of the tumor may lead to a rupture of the scalp with the development of a fungus cerebri and death from infection. The temporal muscle and fascia on the one hand and the suboccipital muscles on the other are, if properly united, sufficiently strong to prevent such an occurrence. Another advantage of the subtemporal route is that the herniated portion of brain is over a silent area and neither paralyses nor aphasia are the direct results of the decompression.

For the subtemporal decompression a curved in-

cision through the scalp is made along the temporal ridge, the flap turned down, and the fascia and muscle split in the direction of their fibers. In decompression for basal fractures the scalp incision can be made obliquely backwards parallel to the fibers of the posterior portion of the temporal muscle. The periosteum should be scraped back and the underlying skull removed for an area of two by three or four inches without disturbing the temporal ridge, the origin of the muscle. The dura should then be opened and a portion of it excised, care being exercised with regard to the meningeal vessels. The temporal muscle, fascia and scalp should now be carefully sutured in layers without drainage. The right temporal region is the area of choice in right handed persons, but if sufficient decompression is not obtained, the opposite side should be similarly treated.

For the exposure of the suboccipital region, a crossbow incision is usually made—a curved, transverse incision just below the origin of the superficial muscles, the trapezius and complexus, joined by a vertical in the median line of the neck. After dividing these muscles about an inch below their origin, and the ligamentum nuchae in the median line the occipital bone is exposed by scraping away the periosteum and the attached deeper muscles. The bone is then removed with a rongeur, beginning at either side, for the hemorrhage from the diploe is apt to be embarrassing as the median line is approached. For the control of the emissary veins Cushing employs dry absorbent cotton which promotes coagulation. The occipital bone can be removed if necessary as far as the foramen magnum. The dura should then be incised on either side of the occipital sinus and the sinus divided between ligatures as advocated by Frazier. A considerable portion of the dura should be excised to permit herniation of the cerebellum. The operation is completed by careful approximation of the muscles, aponeurosis and scalp.

THE SURGICAL TREATMENT OF SUBTENTORIAL CYSTS AND TUMORS.*

By ANDREW STEWART LOBINGIER, M. D., Los Angeles.

It may be said with a large element of truth that the diagnosis of intracranial growths is now based upon data which formerly was either overlooked or failed of proper interpretation. In this respect there has been quite as great advance as in the appreciation of the early and classic evidences of gall stones or of gastric ulcer. There was a time in the very near past when these pathologic conditions were known only as their terminal complexes made them evident.

If we are to accomplish anything vital in the surgery of the brain it must come through the earliest possible recognition of intracranial lesions. This can only be realized by discarding an ancient and misleading symptomatology and in its place establishing proven and dependable evidences of the very beginning of pathologic change. We have had illuminating examples in recent reports of what some of these now well established evidences of intracranial tension are; they have always existed and have only waited an intelligent reading of their significant meaning.

May we not hope that soon we shall have done with mistaking cysts for hysteria, gliomas for neurasthenia; and neuro-retinal edema as significant chiefly of nephritis? The causes of intracranial tension are not so few nor so rare that we should stubbornly persist in finding extraneous causes for the real and palpable symptom complex.

If inspiration may come from the Queen's Square, Augusta and Johns Hopkins clinics, the brilliant work of Horsley, Krause and Cushing should encourage those interested in this field of surgery to work the more earnestly, that those upon whom the burden of diagnosis shall fall will read these melancholy signs early and accurately. A papillœdema allowed to pass unrelieved beyond De Schweinitz's fifth class into a hopeless optic neuritis, Horsley calls a crime. A tumor allowed to grow for years at the expense of a large, active area of the brain, without detection until inoperable and beyond relief is equally a grave reflection. One is continually amazed at the elaborate effort exerted to class these cases in some other—any other, category than brain tumor. Why is this true? The encephalon is not *terra incognito* to many who have given this field studious attention. It is true as Cushing says, (*Lancet,* Jan. 8, 1910) that "intracranial surgery from a technical standpoint is unlike all other forms of surgery in that the delicate structures involved cannot be handled with sponge and clamp and ligature as can the tissue of the body with which the surgeon is more familiar. It is far easier to do harm than good by the rough and rapid operative measures so commonly employed.

"Familiarity with special methods of manipulating a brain under tension, of controlling hemorrhage from the cerebral substance without insult to the tissues, of avoiding injury to the pia-arachnoid until actual extirpation is attempted are essential to success in the work."

It frequently happens that a diagnosis is made only after years have elapsed through which the tumor may not only have caused irreclaimable destruction of the auditory nerve and the retina but grown to such a size or into such a vital area that its removal is impossible, as the following case illustrates:

Wm. F. S. Age 30 years. Born in Minnesota. Was quite normal up to Nov., 1908, when he began to notice the beginning of his present trouble. It began by loss of appetite followed later by vomiting, chiefly after meals and in the morning. He developed a peculiar prickling pain in the occiput which seemed aggravated upon rising from bed or suddenly changing his position. If he remained quiet it did not trouble him. His gait began to incline to the left. Because his nausea and vomiting steadily grew worse it was thought he had a malignant ulcer of the stomach. He consulted celebrated gastrologists and surgeons in the west and after a thorough examination he was sent home with a diagnosis of "general debility." In the latter part of February, 1909, he first noticed failing vision. In March, 1909, he and his family came to California. The headache and vomiting continued

* Read at the Forty-first Annual Meeting of the State Society, Santa Barbara, April, 1911.